REPORT

ON YEARLY INSPECTION OF FLY ASH/SLAG CONCRETE TEST SPECIMENS EXPOSED AT TREAT ISLAND - PHASE II

DEPARTMENT OF ENERGY, MINES & RESOURCES

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1. Introduction

On June 15, 1983, the Department of Supply and Services awarded a contract to the Department of Civil Engineering of the University of New Brunswick for the yearly inspection of concrete test specimens at Treat Island, Maine, U.S.A. The work statement is given in Appendix A

2. Identification and Labeling of Test Specimens

The concrete test specimens at Treat Island are listed in Table 1. Specimens M1 to R4 inclusive remained outside at Eastport, Maine from November 7, 1982 until June 6, 1983. They were then transported to Treat Island. The prisms were first cleaned of seaweed and silt with metal scrapers and wire brushes. They were identified by the markings on the stainless steel straps which had been previously placed around them.

The concrete specimens were labeled on one end using a black waterproof marker. At Treat Island the labeled end is on the sea side so the observer would be standing on the sea side of the specimen and looking towards the shore. The plastic paper and wood siding labels made in 1982 were used as temporary identification. These labels were made for specimens M1 to R4 to complete the set.

3. Pulse Velocity Measurements

The nondestructive examination of concrete prisms utilized a battery powered "V-meter" manufactured by James Electronics (Chicago, Ill.) Serial No. T68542. The meter was calibrated to a reference bar at 26.3 μsec. at the beginning and periodically throughout the testing. Transducers of fifty millimeter diameter were used with a coupling medium made from Kaolinite and glycerin oil. Five readings were taken of each specimen and recorded in Table II. Some readings were unobtainable because of a rough end surface.

4. Photographic and Colour Slide Record

The slides are in Appendix B and are labelled SA01 for the slide of specimen A01. Only one set of slides has been included and they are in copy one of this report. The photographs are in Appendix C and are labeled PA01 for photograph A01. An extra set of slides has been stored in room B19, Head Hall, University of New Brunswick, Fredericton, for future reference.

5. Nature and Degree of Deterioration

Extensive deterioration of only three specimens (SP3, SP4, and SP6) has taken place at this time. These specimens are non-air-entrained concrete with SP3 and SP6 containing superplasticizers. The air-entrained specimens containing superplasticizers are all in good condition.

A general trend towards increasing surface deterioration can be noted in all specimens with increasing replacement of cement with fly ash and slag. This is most noted in specimens with a high water cement ratio and a high percentage replacement of cement with slag. Specimens which contain both fly ash and slag show more deterioration than those which contain only slag for a given cement replacement value.

Wiebenga has pointed out in a paper "Durability of Concrete Structures Along the North Sea Coast of the Netherlands" which was published in the American Concrete Institute publication SP-65 that "slag cement appears to be more susceptible to surface damage (up to 5-10 mm depth) than portland cement concrete is. For frost damage in the interior of the concrete the effect appears to be reversed". The surface deterioration that he refers to is quite evident after comparing specimens containing fly ash and/or slag to those without after 4 - 5 years exposure.

Specimens containing lightweight aggregate show a pattern of deterioration that is different from normal weight concrete. After three years of exposure to freezing and thawing, they exhibit either no deterioration or show a slight loss of mortar. No signs of spalling or break-down of the aggregates can be seen. Their pulse velocities are ~~higher~~ lower than those of the other specimens due to the lower density of lightweight concrete. All of the lightweight

concrete specimens ~~decreased~~ increased their pulse velocities from 1982 to 1983, indicating an increase in strength.

6. Conclusion

The replacement of cement by slag has no apparent effect after up to five years exposure at Treat Island of concrete with a water cement ratio of 0.4. There is no effect at a water cement ratio as high as 0.6 if less than 25% of the cement is replaced by slag.

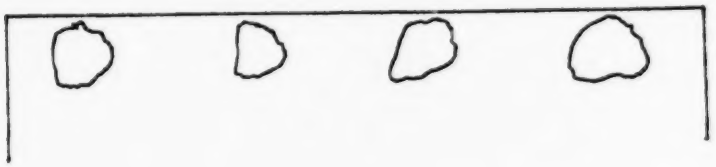
In view of the limited number of years that the specimens have been at the exposure site it would appear prudent to wait a little longer before making specific recommendations. The variables investigated are such that deterioration is on the threshold of proceeding rapidly and to obtain maximum information the specimens should be examined and studied closely over the next decade. During that time the effect of mix proportion, cement type and the role of supplementary cementing materials should become evident.

It is of prime importance to continue maintaining adequate labeling and documentation of the specimens at the site so that should a storm disrupt the installation the specimens can be identified and repositioned.

FIGURE I

Visual Inspection Rating System

0: almost no aggregates are exposed

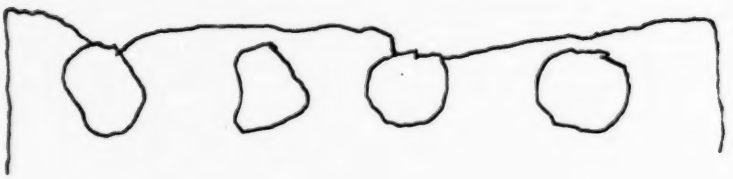


1: a few aggregates are exposed

Figure 2 cont'd

Visual Inspection Rating System

2: many aggregates are exposed



3: most surface aggregates are slightly exposed

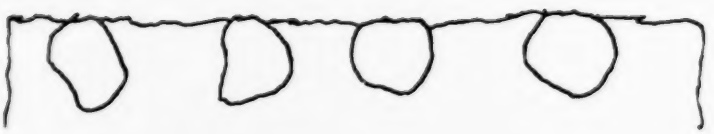
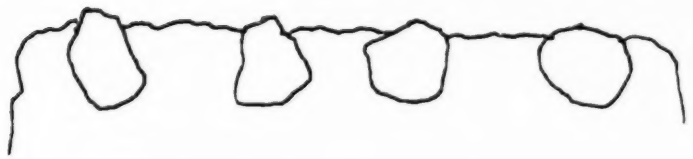


Figure I cont'd

Visual Inspection Rating System

4: most surface aggregates are well exposed



5: most surface aggregates are almost completely exposed

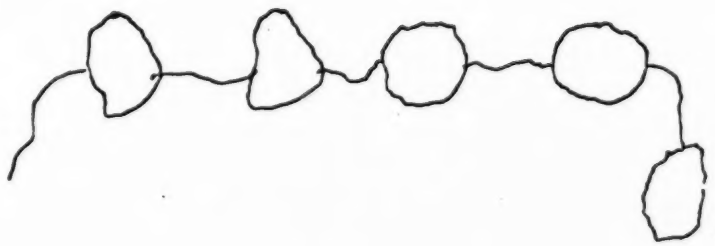


TABLE I

Description of Specimens

SERIES	% SLAG	% F.A.	% S.F.	WT OF CEMENT	WT OF SLAG	WT OF FLY ASH	WT OF SILICA FUMES	CEMENT TYPE	W/C	SLUMP	AIR CONTENT	UNIT WT	YEAR CAST	REMARKS
A01	0	0	0	667	0	0	0	10	0.4	2 3/4	5.6	146	1978	
A02	25	0	0	492	164	0	0	10	0.4	2 1/4	7.0	144	1978	
A03	25	0	0	536	179	0	0	10	0.4	3 1/2	6.6	143	1978	
A05	0	0	0	749	0	0	0	10	0.4	3 1/2	6.5	145	1978	
A06	45	0	0	410	336	0	0	10	0.4	2 7/8	6.8	145	1978	
A07	45	0	0	409	335	0	0	10	0.4	2 1/4	6.4	144	1978	
A09	0	0	0	750	0	0	0	10	0.4	3 5/8	5.8	145	1978	
A10	65	0	0	260	483	0	0	10	0.4	2 1/4	6.0	144	1978	
A11	65	0	0	262	489	0	0	10	0.4	3	6.4	141	1978	
A13	0	0	0	661	0	0	0	50	0.4	2 3/4	6.2	146	1978	
B01	0	0	0	551	0	0	0	10	0.5	3 1/2	6.5	144	1978	
B02	25	0	0	413	138	0	0	10	0.5	3 7/8	6.7	143	1978	
B03	25	0	0	417	139	0	0	10	0.5	3 5/8	5.9	144	1978	
B05	0	0	0	539	0	0	0	10	0.5	3 3/8	5.5	148	1978	
B06	45	0	0	308	253	0	0	10	0.5	3	6.4	144	1978	
B07	45	0	0	308	252	0	0	10	0.5	2 3/4	6.8	144	1978	
B09	0	0	0	565	0	0	0	10	0.5	3	6.5	146	1978	
B10	65	0	0	196	363	0	0	10	0.5	3	7.0	144	1978	
B11	65	0	0	197	366	0	0	10	0.5	2 1/2	5.6	145	1978	
B13	0	0	0	530	0	0	0	50	0.5	3 3/8	6.2	146	1978	

TABLE I - continued

SERIES	% SLAG	% F.A.	% S.F.	WT OF CEMENT	WT OF SLAG	WT OF FLY ASH	WT OF SILICA FUMES	CEMENT TYPE	W/C	SLUMP	AIR CONTENT	UNIT WT	YEAR CAST	REMARKS
C01	0	0	0	476	0	0	0	10	0.6	3 1/2	5.8	147	1978	
C02	25	0	0	353	118	0	0	10	0.6	3 7/8	6.4	145	1978	
C03	25	0	0	353	118	0	0	10	0.6	4	5.5	146	1978	
C05	0	0	0	450	0	0	0	10	0.6	3	5.7	145	1978	
C06	45	0	0	248	203	0	0	10	0.6	3	5.2	145	1978	
C07	45	0	0	244	200	0	0	10	0.6	3 1/2	6.5	143	1978	
C09	0	0	0	448	0	0	0	10	0.6	3 1/2	5.4	145	1978	
C10	65	0	0	158	293	0	0	10	0.6	3 5/8	5.5	145	1978	
C11	65	0	0	157	292	0	0	10	0.6	3 5/8	5.2	144	1978	
C13	0	0	0	458	0	0	0	50	0.6	3 7/8	5.4	148	1978	
SP1	0	0	0	563	0	0	0	10	0.5	3 1/4	5.6	146	1978	
SP2	0	0	0	559	0	0	0	10	0.5	Collapse	6.3	145	1978	
SP3	0	0	0	587	0	0	0	10	0.5	Collapse	0.9	152	1978	
SP4	0	0	0	588	0	0	0	10	0.5	2 3/8	1.5	152	1978	
SP5	0	0	0	557	0	0	0	10	0.5	Collapse	6.2	144	1978	
SP6	0	0	0	581	0	0	0	10	0.5	Collapse	0.3	150	1978	

TABLE I - continued

SERIES	% SLAG	% F.A.	% S.F.	WT OF CEMENT	WT OF SLAG	WT OF FLY ASH	WT OF SILICA FUMES	CEMENT TYPE	W/C	SLUMP	AIR CONTENT	UNIT WT	YEAR CAST	REMARKS
D01	0	0	0	665	0	0	0	10	0.4	2 1/8	6.0	151	1979	
D02	0	25	0	473	0	158	0	10	0.4	3	6.2	143	1979	
D03	0	25	0	473	0	158	0	10	0.4	2 1/4	6.4	143	1979	
D05	0	0	0	693	0	0	0	10	0.4	2 1/8	5.3	147	1979	
D06	40	20	0	271	271	135	0	10	0.4	2	6.4	142	1979	
D07	40	20	0	271	271	135	0	10	0.4	2 1/2	5.8	142	1979	
D09	0	0	0	693	0	0	0	10	0.4	3 1/8	5.7	147	1979	
D10	60	20	0	139	416	139	0	10	0.4	2 1/8	6.2	144	1979	
D11	60	20	0	142	424	142	0	10	0.4	2 3/8	5.5	142	1979	
D13	0	0	0	648	0	0	0	50	0.4	4	6.6	146	1979	
D16	0	0	0	624	0	0	0	20	0.4	3 1/4	5.4	148	1979	
E01	0	0	0	540	0	0	0	10	0.5	4	5.2	147	1979	
E02	0	25	0	404	0	135	0	10	0.5	3 3/4	5.2	146	1979	
E03	0	25	0	389	0	130	0	10	0.5	4	6.6	144	1979	
E05	0	0	0	502	0	0	0	10	0.5	4	5	148	1979	
E06	40	20	0	216	216	108	0	10	0.5	3 1/4	6.9	145	1979	
E07	40	20	0	205	205	102	0	10	0.5	3 7/8	6.3	143	1979	
E09	0	0	0	501	0	0	0	10	0.5	3 3/8	5.6	147	1979	
E10	60	20	0	96	289	97	0	10	0.5	3 3/4	6.9	143	1979	
E11	60	20	0	99	297	99	0	10	0.5	3 3/8	6.2	144	1979	
E13	0	0	0	512	0	0	0	50	0.5	2	5.5	148	1979	
E16	0	0	0	501	0	0	0	20	0.5	2 1/8	6.8	144	1979	

TABLE I - continued

SERIES	% SLAG	% F.A.	% S.F.	WT OF CEMENT	WT OF SLAG	WT OF FLY ASH	WT OF SILICA FUMES	CEMENT TYPE	W/C	SLUMP	AIR CONTENT	UNIT WT	YEAR CAST	REMARKS
F01	0	0	0	414	0	0	0	10	0.6	3 1/8	5.3	148	1979	
F02	0	25	0	306	0	102	0	10	0.6	4	5.2	146	1979	
F03	0	25	0	293	0	98	0	10	0.6	3 1/2	6.7	143	1979	
F05	0	0	0	392	0	0	0	10	0.6	2 1/4	6.5	144	1979	
F06	40	20	0	164	164	82	0	10	0.6	3 3/4	6.5	144	1979	
F07	40	20	0	165	165	82	0	10	0.6	4	6.5	143	1979	
F09	0	0	0	381	0	0	0	10	0.6	3	6.5	142	1979	
F10	60	20	0	77	231	77	0	10	0.6	3 1/4	6.4	144	1979	
F11	60	20	0	77	230	76	0	10	0.6	3	6.5	143	1979	
F13	0	0	0	379	0	0	0	50	0.6	2 1/4	6.0	146	1979	
F16	0	0	0	353	0	0	0	20	0.6	3	6.9	142	1979	

TABLE I - continued

SERIES	% SLAG	% F.A.	% S.F.	WT OF CEMENT	WT OF SLAG	WT OF FLY ASH	WT OF SILICA FUMES	CEMENT TYPE	W/C	SLUMP	AIR CONTENT	UNIT WT	YEAR CAST	REMARKS
G01	0	0	0	404	0	0	0	10	-	2 3/4	6.0	119	1980	
G03	25	0	0	308	103	0	0	10	-	3	6.5	120	1980	
G04	25	0	0	310	104	0	0	10	-	3 1/4	5.2	120	1980	
G06	0	0	0	406	0	0	0	10	-	2 1/2	6.1	119	1980	
G07	45	0	0	228	187	0	0	10	-	2 1/4	5/4	121	1980	
G08	45	0	0	225	184	0	0	10	-	2 3/4	6.5	119	1980	
G10	0	0	0	403	0	0	0	10	-	2 1/2	6.6	118	1980	
G11	65	0	0	142	264	0	0	10	-	3 1/2	7.0	118	1980	
G12	65	0	0	144	267	0	0	10	-	3	5.7	119	1980	
G14	0	0	0	406	0	0	0	50	-	3 1/2	5.6	119	1980	
H01	0	0	0	600	0	0	0	10	-	3	5.6	121	1980	
H03	25	0	0	452	151	0	0	10	-	3	6.0	121	1980	
H04	25	0	0	444	148	0	0	10	-	3 3/4	7.0	119	1980	
H06	0	0	0	595	0	0	0	10	-	3	6.0	121	1980	
H07	45	0	0	333	273	0	0	10	-	3 1/2	6.7	120	1980	
H08	45	0	0	335	274	0	0	10	-	3 1/4	6.8	120	1980	
H10	0	0	0	598	0	0	0	10	-	3	6.8	121	1980	
H11	65	0	0	217	403	0	0	10	-	3	6.8	120	1980	
H12	65	0	0	216	401	0	0	10	-	2 3/4	6.0	121	1980	
H14	0	0	0	594	0	0	0	50	-	3 1/8	7.0	119	1980	

TABLE I - continued

SERIES	% SLAG	% F.A.	% S.F.	WT OF CEMENT	WT OF SLAG	WT OF FLY ASH	WT OF SILICA FUMES	CEMENT TYPE	W/C	SLUMP	AIR CONTENT	UNIT WT	YEAR CAST	REMARKS
I01	0	0	0	798	0	0	0	10	-	3 1/4	5.8	120	1980	
I03	25	0	0	606	202	0	0	10	-	3 1/4	6.3	121	1980	
I04	25	0	0	611	204	0	0	10	-	3	5.8	121	1980	
I06	0	0	0	799	0	0	0	10	-	2 1/2	5.7	120	1980	
I07	45	0	0	440	360	0	0	10	-	2 7/8	5.5	119	1980	
I08	45	0	0	440	360	0	0	10	-	3 1/4	5.6	119	1980	
I10	0	0	0	791	0	0	0	10	-	3 1/2	7	119	1980	
I11	65	0	0	279	518	0	0	10	-	3 3/4	6	117	1980	
I12	65	0	0	285	529	0	0	10	-	3 1/4	5.5	120	1980	
I14	0	0	0	783	0	0	0	50	-	3	6.9	119	1980	

TABLE I - continued

SERIES	% SLAG	% F.A.	% S.F.	WT OF CEMENT	WT OF SLAG	WT OF FLY ASH	WT OF SILICA FUMES	CEMENT TYPE	W/C	SLUMP	AIR CONTENT	UNIT WT	YEAR CAST	REMARKS
J01	0	0	0	741	0	0	0	10	0.40	3 5/8	6.6	146	1981	
J02	0	0	0	741	0	0	0	10	0.40	3 1/4	6.6	146	1981	
J04	0	25	0	536	0	179	0	10	0.40	4	7.0	141	1981	
J05	0	25	0	514	0	171	0	10	0.40	3 1/8	6.8	145	1981	
J07	0	0	0	723	0	0	0	50	0.40	3 1/8	5.0	151	1981	
K01	0	0	0	586	0	0	0	10	0.50	3	5.5	148	1981	
K02	0	0	0	583	0	0	0	10	0.50	3 1/8	6.2	147	1981	
K04	0	25	0	412	0	137	0	10	0.50	2 3/4	5.2	147	1981	
K05	0	25	0	404	0	135	0	10	0.50	2 1/2	6.1	147	1981	
K07	0	0	0	525	0	0	0	50	0.50	3 3/4	6.0	149	1981	
L01	0	0	0	444	0	0	0	10	0.60	3	6.0	148	1981	
L02	0	0	0	438	0	0	0	10	0.60	4.0	6.0	147	1981	
L04	0	25	0	309	0	103	0	10	0.60	3 1/8	6.1	147	1981	
L05	0	25	0	310	0	103	0	10	0.60	3 1/2	5.8	149	1981	
L07	0	0	0	412	0	0	0	50	0.60	2 1/2	5.3	150	1981	

TABLE I - continued

SERIES	% SLAG	% F.A.	% S.F.	WT OF CEMENT	WT OF SLAG	WT OF FLY ASH	WT OF SILICA FUMES	CEMENT TYPE	W/C	SLUMP	AIR CONTENT	UNIT WT	YEAR CAST	REMAR
M01	0	0	0	734	0	0	0	10	0.4	95mm	6.5	144	1982	
M02	0	0	0	746	0	0	0	10	0.4	89	5.9	146	1982	
M03	80	0	0	150	601	0	0	10	0.4	82	5.8	146	1982	
M04	80	0	0	149	596	0	0	10	0.4	95	6.2	145	1982	
N01	0	0	0	554	0	0	0	10	0.5	88	6.3	148	1982	
N02	0	0	0	552	0	0	0	10	0.5	70	5.6	147	1982	
N03	80	0	0	109	436	0	0	10	0.5	82	6.0	145	1982	
N04	80	0	0	108	431	0	0	10	0.5	98	6.7	143	1982	
O01	0	0	0	434	0	0	0	10	0.6	88	5.2	147	1982	
O02	0	0	0	437	0	0	0	10	0.6	75	5.5	147	1982	
O03	80	0	0	85	340	0	0	10	0.6	108	6.3	143	1982	
O04	80	0	0	86	344	0	0	10	0.6	102	6.1	145	1982	
P01	0	0	0	439	0	0	0	10	0.6	82	6.4	145	1982	
P02	0	0	10+	434	0	0	43	10	0.6	73	6.5	143	1982	
P03	0	0	15+	441	0	0	66	10	0.6	78	5.3	146	1982	
P04	0	0	20+	437	0	0	88	10	0.6	92	6.3	144	1982	

TABLE I - continued

SERIES	% SLAG	% F.A.	% S.F.	WT OF CEMENT	WT OF SLAG	WT OF FLY ASH	WT OF SILICA FUMES	CEMENT TYPE	W/C	SLUMP	AIR CONTENT	UNIT WT	YEAR CAST	REMARKS
Q01	0	0	0	409	0	0		10	0.6	75	6.3	144	1982	
Q02	0	0	10	368	0	0	41	10	0.6	65	6.4	145	1982	
Q03	0	0	15	347	0	0	61	10	0.6	84	6.5	144	1982	
Q04	0	0	20	330	0	0	83	10	0.6	72	6.0	145	1982	
R01	0	0	0	468	0	0	0	10	0.6	50	1.5	150	1982	
R02	0	0	10	432	0	0	48	10	0.6	88	1.1	154	1982	
R03	0	0	15	405	0	0	72	10	0.6	100	0.9	152	1982	
R04	0	0	20	381	0	0	95	10	0.6	83	1.1	152	1982	

TABLE II

RATING OF SPECIMENS

Series	Rating	Remarks
A01	0	
A02	0	
A03	0	
AO5	0	
AO6	1	Some loss of mortar
AO7	1	Some loss of mortar
AO9	0	
A10	1	Some loss of motar
A11	1	Some loss of mortar
A13	1	Some loss of mortar
B01	0	
BO2	0	
B03	0	
B05	0	
B06	2	Some loss of mortar
B07	1	Some loss of mortar
B09	0	
B10	1	Some loss of mortar
B11	2	Large spall, some loss of mort
B13	0	

Table II continued

Series	Rating	Remarks
C01	1	Slight end damage
C02	0	Slight end damage
C03	2	2 mm loss of mortar
C05	0	Slight end scaling
C06	2	Some end damage
C07	2	5 mm loss of mortar
C09	0	
C10	3	5 mm loss of mortar
C11	4	4 mm loss of mortar
C13	0	Slight end damage
SP1	1	
SP2	0	
SP3	7	Severe loss of material at ends
SP4	6	Accelerated damage to ends
SP5	1	
SP6	9	5% of specimen remaining
D01	1	
DO2	0	
DO3	1	
DO5	0	
DO6	1	
DO7	2	
DO9	1	
D10	3	2 mm loss of mortar

Table II continued

Series	Rating	Remarks
D11	3	
D13	0	
D16	0	
E01	0	Popout
E02	0	
E03	0	
E05	0	
E06	2	
E07	3	
E09	0	
E10	2	Aggregats exposed on sides
E11	2	Aggregats exposed on sides
E13	1	
E16	0	
F01	0	
F02	1	
F03	2	
F05	1	
F06	2	Aggregates exposed on sides
F07	4	Aggregates exposed on sides
F09	1	
F10	5	
F11	5	
F13	1	
F16	1	

Table II cont'd

Series	Rating	Remarks
G01	0	loss of 2 mm of mortar
G03	0	loss of 2 mm of mortar
G04	0	loss of 2 mm of mortar
G05	0	loss of 2 mm of mortar
G07	0	loss of 3 mm of mortar
G08	0	loss of 3 mm of mortar
G10	0	loss of 2 mm of mortar
G11	0	loss of 0 mm of mortar
G12	0	loss of 0 mm of mortar
G14	0	loss of 0 mm of mortar
H01	0	loss of 0 mm of mortar
H03	0	loss of 0 mm of mortar
H04	0	loss of 1 mm of mortar
H06	0	loss of 0 mm of mortar
H07	0	loss of 0 mm of mortar
H08	0	loss of 1 mm of mortar
H10	0	loss of 0 mm of mortar
H11	0	loss of 1 mm of mortar
H12	0	loss of 1 mm of mortar
H14	0	loss of 0 mm of mortar

Table II continued

Series	Rating	Remarks
I01	0	
I02	0	
I03	0	
I04	0	
I05	0	
I06	0	
I07	0	
I08	0	
I09	0	
I10	0	
I11	0	
I12	0	
I13	0	
I14	0	

Table 22 cont'd

Series	Rating	Remarks
J01	0	
J02	0	
J04	0	
J05	0	
J07	0	
K01	0	
K02	0	
K04	0	Slight loss of 1 mm of mortar
K05	0	Slight loss of 1 mm of mortar
K07	0	
L01	0	
L02	0	
L04	0	15 aggregates exposed
L05	0	15 aggregates exposed
L07	0	10 aggregates exposed
M01 to R04	0	

TABLE III

Ultrasonic Pulse Velocity Readings

PRISM NO.	1 TOP RIGHT	2 TOP LEFT	3 BOTTOM LEFT	4 BOTTOM RIGHT	5 CENTRE	REMARKS
A01	201.4	200.7	199.8	198.6	204.9	
A02	211.2	209.5	204.8	204.6	215.4	
A03	211.7	210.4	208.7	207.6	214.9	
A05	205.4	205.0	200.6	197.8	209.6	
A06	207.4	212.6	201.7	202.6	218.6	
A07	206.4	211.7	208.1	204.4	216.7	
A09	205.4	204.8	199.8	201.8	209.4	
A10	209.6	206.6	202.4	203.8	221.1	
A11	210.1	210.4	205.4	206.8	225.9	
A13	206.6	203.2	197.6	197.8	205.3	
B01	216.8	213.3	205.9	201.0	210.8	
B02	214.5	213.7	204.6	206.3	211.3	
B03	209.7	217.6	203.0	200.6	211.6	
B05	210.5	212.8	200.7	199.6	209.3	
B06	216.1	215.7	201.8	201.6	216.9	
B07	212.9	213.4	205.5	202.9	213.8	
B09	217.1	213.7	203.8	207.4	213.4	
B10	215.2	259.1	294.2	206.1	218.0	
B11	214.2	315.0	302.6	385.5	221.4	
B13	211.4	213.8	197.7	198.2	207.2	
C01	214.6	211.7	207.8	207.0	215.0	
C02	214.5	214.0	205.5	203.6	212.2	
C03	215.2	213.8	204.5	204.8	212.2	
C05	215.8	217.7	204.3	200.1	211.3	
C06	211.7	213.1	205.5	203.7	213.3	
C07	218.9	217.1	205.7	202.8	215.2	
C09	215.9	220.8	208.9	206.9	216.5	
C10	320.1	301.0	398.0	413.0	218.5	
C11	302.0	298.0	405.0	294.0	263.0	
C13	218.6	211.6	196.9	194.8	210.6	
SP1	210.5	209.5	202.6	203.1	211.3	
SP2	215.6	215.4	206.8	204.8	213.6	
SP3	-	-	-	-	-	
SP4	-	208.5	199.0	215.1	202.6	
SP5	208.7	208.0	204.5	203.8	208.1	
SP6	-	-	-	-	-	

TABLE III - continued

PRISM NO.	1 TOP RIGHT	2 TOP LEFT	3 BOTTOM LEFT	4 BOTTOM RIGHT	5 CENTRE	REMARKS
D01	204.9	202.9	199.8	198.2	206.1	
D02	210.0	209.8	205.0	205.4	211.0	
D03	209.6	209.4	205.3	204.9	211.3	
D05	202.9	201.8	198.1	198.5	203.6	
D06	211.3	210.5	208.4	206.0	218.3	
D07	213.8	205.6	206.9	206.9	221.1	
D09	207.0	208.2	198.7	202.4	206.0	
D10	227.8	224.5	209.8	209.0	234.7	
D11	224.6	225.7	218.5	211.5	235.6	
D13	212.4	211.6	201.9	201.3	211.6	
D16	203.6	204.3	199.0	198.6	205.6	
E01	205.4	207.3	199.3	200.1	207.3	
E02	213.3	211.4	205.1	204.1	212.0	
E03	222.4	222.2	209.6	210.5	216.4	
E05	211.1	208.4	205.0	203.8	210.3	
E06	220.8	221.0	211.8	210.4	224.2	
E07	219.4	220.9	210.4	211.1	220.6	
E09	209.3	210.4	206.0	200.6	211.6	
E10	228.1	234.0	216.7	213.9	229.4	
E11	437	437	213.3	216.9	228.6	
E13	208.0	208.6	203.9	204.7	209.7	
E16	213.7	214.8	209.7	206.5	214.6	
F01	215.4	214.5	208.6	207.4	217.4	
F02	217.6	220.4	211.4	207.5	219.4	
F03	221.7	221.1	217.4	212.0	221.4	
F05	218.7	216.4	213.8	211.6	221.1	
F06	338.7	424	221.1	312.0	252.4	
F07	222.3	223.3	297.1	214.6	226.7	
F09	220.4	223.7	213.7	216.3	220.4	
F10	-	-	-	-	458.0	
F11	-	-	-	-	-	
F13	222.1	217.8	211.6	211.7	216.4	
F16	227.4	225.9	224.9	219.4	227.4	

TABLE III - continued

	1	2	3	4	5	
PRISM NO.	TOP RIGHT	TOP LEFT	BOTTOM LEFT	BOTTOM RIGHT	CENTRE	REMARKS
G01	246.9	244.5	237.7	240.7	250.2	
G03	241.4	242.4	251.4	276.4	299.8	
G04	240.2	241.8	237.1	237.4	240.6	
G06	240.4	240.5	236.4	234.2	241.5	
G07	234.2	233.6	231.2	231.1	235.2	
G08	237.1	236.4	236.1	235.8	235.7	
G10	242.9	242.0	238.7	239.0	247.9	
G11	284.9	304.2	360.8	280.0	386.7	
G12	234.6	233.8	306.7	357.7	257.0	
G14	248.2	247.7	242.2	241.5	244.7	
H01	230.1	227.6	227.3	227.1	230.4	
H03	226.7	226.5	225.0	225.3	225.4	
H04	231.9	230.2	230.4	228.8	231.1	
H06	231.0	230.4	226.4	225.5	230.0	
H07	227.6	227.1	224.4	224.9	225.3	
H08	226.4	225.9	226.4	224.1	226.3	
H10	230.1	232.2	227.4	226.8	230.0	
H11	226.1	226.8	223.9	224.7	225.2	
H12	227.4	227.4	225.9	225.8	226.9	
H14	230.5	231.5	229.5	229.0	231.1	
I01	225.9	227.1	223.6	223.6	225.9	
I03	224.0	225.0	222.1	223.1	222.9	
I04	222.1	222.3	220.9	220.4	222.1	
I06	225.0	226.8	224.6	222.8	226.4	
I07	225.3	226.7	224.0	222.0	224.8	
I08	225.9	225.3	224.3	225.6	226.6	
I10	228.7	229.3	226.7	224.5	227.6	
I11	228.6	228.3	227.2	226.4	228.1	
I12	229.5	229.4	223.9	223.4	226.8	
I14	226.1	225.9	224.8	221.9	225.4	
J01	200.4	202.5	197.4	197.1	202.7	
J02	199.8	200.9	194.0	194.5	199.6	
J04	212.7	215.8	199.4	198.0	206.9	
J05	206.1	202.7	196.8	196.1	202.9	
J07	195.8	195.9	190.4	188.2	194.8	

TABLE III - continued

PRISM NO.	1 TOP RIGHT	2 TOP LEFT	3 BOTTOM LEFT	4 BOTTOM RIGHT	5 CENTRE	REMARKS
K01	203.4	204.2	191.9	191.4	199.1	
K02	203.9	204.0	198.2	192.9	201.3	
K04	198.4	200.7	193.8	194.1	196.3	
K05	203.7	204.8	196.4	193.1	201.1	
K07	206.0	204.0	194.5	195.9	201.6	
L01	211.9	204.8	196.9	196.6	201.6	
L02	208.9	210.1	199.9	200.4	205.5	
L04	206.3	209.6	200.0	195.4	202.7	
L05	200.8	202.3	194.8	196.1	201.3	
L07	205.0	206.7	203.5	199.0	204.9	
M1	197.8	198.3	192.1	191.6	196.9	
2	196.4	197.3	191.4	191.3	195.7	
3	202.7	203.6	195.3	195.4	214.5	
4	207.4	209.6	198.6	196.1	214.5	
N1	201.1	203.6	195.6	194.5	200.1	
2	199.5	198.5	194.5	192.9	195.9	
3	212.0	212.9	198.1	198.9	214.7	
4	216.4	216.2	202.7	202.4	217.7	
O1	205.4	202.8	199.8	198.6	203.8	
2	207.6	206.1	200.0	200.9	204.1	
3	224.3	223.8	207.9	206.4	218.6	
4	215.1	217.2	204.6	202.4	213.6	
P1	209.4	208.8	199.1	199.5	204.1	
2	205.7	205.9	202.0	201.1	205.7	
3	202.5	201.7	199.8	198.2	203.7	
4	207.4	208.4	202.9	203.9	207.2	
Q1	210.2	210.1	201.8	202.2	207.2	
2	210.1	208.9	201.9	199.5	204.1	
3	211.0	210.5	202.5	203.9	203.6	
4	212.6	210.6	203.4	203.9	207.0	
R1	189.9	191.1	188.4	188.2	188.5	
2	191.4	192.9	189.6	188.2	190.9	
3	196.0	194.7	191.7	189.9	193.9	
4	196.2	194.0	192.6	191.9	195.0	

APPENDIX "A"

STATEMENT OF WORK

The Contractor shall travel to Treat Island and test and inspect more than 100 Flyash/slag/concrete test blocks which have been installed at Treat Island (a facility operated by U.S. Corps of Engineers) during the last four years.

The Contractor shall carry out the following:

(a) a report on the visual inspection of each block with proper identification of the blocks;

(b) pulse velocity determination of test blocks;

(c) photographic (and colour slides) record of the deteriorated blocks, and nature and degree of deterioration;

(d) construct display board for photographic representation of specimens

(e) a detailed report of the testing and inspection;

(f) rearrangement of the test specimens after the inspection.

POOR

QUALITY

ORIGINAL